SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF SOME NOVEL MANNICH BASES OF 7-AZAISATIN DERIVATIVES

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ABSTRACT

In the field of medicinal chemistry, the synthesis of heterocyclic compounds by different routes while incorporating a variety of known pharmacophores into their molecular systems and evaluating them for possible pharmacological properties. Several of their derivatives and Mannich bases of isatin have been found to be greater interest in view of their disparate biological and pharmacological properties. Keeping this in view it is aimed to synthesis some novel Mannich bases of 7 aza isatin derivatives for evaluation of antimicrobial activity. All the examined compounds showed considerable active against all the tested strains of microorganism.

KEY WORDS

Mannich bases, 7-Aza Isatin, Antibacterial activity, Antifungal activity.

INTRODUCTION

Since the beginning of the search of medicinally important synthetic compounds heterocyclic chemistry always remained the point of attraction because of their diverse biological properties [1-3]. Substitution of heterocyclic compounds on various positions produced medicinally important analogues which are used in the treatment of various diseases. Isatin was first obtained by erdmann [4] and laurent [5] in 1840 as a product of the oxidation of indigo dye by nitric acid and chromic acid Isatin is one of the most important heterocyclic compounds in particular, compounds bearing the Isatin nucleus is known to have unique and were reported to possess antimicrobial [6], analgesic, anti-inflammatory [7], anticancer [8,9], anti-tubercular [10], antimalarial [11], anticonvulsant, anti-depressant activities [10]. so, it’s thought worthwhile to synthesis all the compounds and have been screened for antimicrobial activity against two Gram positive bacteria S. aureus, B. subtilis and two Gram negative bacteria E. coli, P. aeruginosa and also against two fungal strains C. albicans, A. niger and comparable with ampicillin and clotrimazole(standards).

MATERIALS AND METHODS

Chemistry
The chemicals and solvents used for the experimental work were laboratory grade only. The melting points were determined by open capillary using Tosniwal melting point apparatus and are uncorrected. Purity of compounds was checked by TLC on silica gel precoated plates. IR spectra were recorded in KBr pellets on FTIR Brucker spectrophotometer and frequencies are expressed in cm⁻¹. The 1HNMR spectra were recorded on 400MHz Brucker DPX using CDCl₃ Chemical shift values are reported as values in ppm relative to TMS as internal standard, GC/EIMS analyses were performed using an Agilent 6890 gas chromatograph (Agilent Technologies, Palo Alto, CA, USA). Elemental analysis was performed on PerkinElmer series-2400 (PerkinElmer, Inc USA) at Center of analytical instrumentation, NIT, Warangal, Telangana, India. The titled compounds were coded as PSK-a-m.

**General procedure for the synthesis of title compounds**

**a) Synthesis of 1H-pyrrolo [2,3] pyridine-2,3-dione (II)**

Taken 7-aza indole (2.4 mmol), N-bromo succinimide (0.90g, 5.0 mmol) in 20ml of anhydrous dimethyl sulphoxide were stirred at 60°C for 6h and then above 80°C for 20 h under reduced pressure. Poured the reaction mixture into 50ml water followed by extracting with 10ml of dichloromethane three times, the combined extracts were washed three times with distilled water. After removal of the solvent, the residue was purified with dichloromethane. Molecular formula, C₁₆H₁₃N₃O₃; Molecular weight, 148; Rf value, 0.52 (Chloroform: Ethyl acetate 3:2) The yield of 7-azalsatin was 82%, m.p.200-203°C FT-IR spectrum (KBr, in cm⁻¹): 3448(N-H str), 1617(C=O str), 1461 (Ar HC=CH str), δ ppm: 6.8-7.8(m, 4H, Ar-H), 11 (s, 1H, NH), Mass m/z 402 (M+1), Elemental analysis (Calcd/Found)%: C, 20.92/21.0; H, 1.00/0.99; I, 63.15/63.0; N, 6.97/6.90; O, 7.96/7.99.

**b) Synthesis of ethyl(1,2-dihydro-2-oxopyrrolo [2,3] pyridin-3-ylidene amino) benzoate(III).**

Dissolved an appropriate quantity of 7-azaindole-2,3-dione(0.01mol) in alcohol (20ml) and added ethyl p-amino benzoate (0.01mol) and few drops of glacial acetic acid. The reaction mixture was stirred well and refluxed for 3h. Filtered the resultant yellow crystalline solid and washed repeatedly with small quantity of methanol. The product was dried and purified by recrystallization from chloroform. Mol. Formula, C₁₆H₁₃N₃O₃; Mol. Wt, 295; Rf value, 0.53 (n-Hexane: EtOAc 3:2), % yield, 78, m.p, 187-189°C. FT-IR spectrum (KBr, in cm⁻¹): 3187(NH str), 1751(Ester C=O str), 2984(Aliphatic CH Str), 3020 (Ar-HC str), δH NMR (DMSO-d₆), ppm: 1.2(t, 3H, CH₃); 4.2(q, 2H, CH₂), 4.0(s, 2H, NH), 6.8-7.7(m, 3H, Ar-H), Mass m/z 295 (M⁺), Elemental analysis (Calcd/Found)%: C, 65.08/65.0; H, 4.44/4.3; N, 14.23/14.33; O, 16.2/16.5.

**c) Synthesis of ethyl 4-(1′- [(substituted amino) 2-oxopyrrolo [2,3-b] pyridin-3-ylidene amino) benzoate (PSK-a-m).**

In minimum quantity of dimethyl formamide suspended compound of ethyl4-(1,2-dihydro-2-oxopyrrolo [2,3] pyridin-3-ylidene amino) benzoate (0.001mol), and added formaldehyde (1ml, 37%v/v) and various secondary amines(R) (0.001mol) with vigorous stirring. Warmed the solution on a water bath for 2min. and stirred for an hour. Then left at room temperature overnight. By the addition of water, the compounds (PSK-a-m) was filtered, washed thoroughly with water, dried and purified by recrystallization from ethanol. Completion of the reaction was monitored by TLC [ethyl acetate: chloroform (2:3)]. Purification of the compounds may have affected by recrystallization. All the desired compounds
were physically characterized and expressed in
Table-1.

Antimicrobial activity
For bacterial growth nutrient agar media was used
having composition beef extract, 3g; bacteriological
peptones, 5g; agar, 20g, the pH was adjusted to
6.2 ±0.2 at 25 (±2) °C and for fungal growth malt
extract agar (MEA) was used composed of malt
extract, 20 g; bacteriological peptone, 5g; agar, 20g,
the pH was adjusted to 5.4 ±0.2 at 25 (±2) °C. Media
was prepared by dissolving the all ingredients in 1L
distilled water and heated upto 60-70° C and was
sterilized in an autoclave at 121° C for 15-20 mins.
Against the several species the antibacterial and
antifungal activity was expressed by the
measurement of zone of inhibition by agar diffusion
method\(^{14,15}\). At equal distance four holes were made
in the sterile agar plates with the help of sterile cork
borer in both media i.e. in nutrient agar and in malt
extract agar. The synthesized compounds were
dissolved in DMSO, 200µg/ml concentration of each
compound was filled in the holes. Controlled holes
were filled with DMSO solvent. For bacterial isolates
plates were placed in a BOD at 37° C ± 2° C and on the
other hand fungal isolates were incubated at 28° C ±
2° C for 24-48hrs. Zone of inhibition created by active
compounds were measured after 24-48 hrs.

Ampicillin was used as standard antibacterial agent
while Clotrimazole was used as a standard antifungal
agent. The antimicrobial activity of the synthesized
compounds is shown in table-3. Ampicillin and
clotrimazole(standard) were active at 10 µg/ml on all
the Gram (+ve) bacteria with a zone of inhibition
for Bacillus subtilis, Staphylococcus aureus, Gram (-
ve) bacteria Pseudomonas Vulgaris, Escherichia coli
and two fungal strains C. albicans, A. niger.

RESULTS AND DISCUSSION

Chemistry:
A series of novel manniach bases of 7-aza isatin
derivatives (PSKa-m) were obtained by oxidising 7-
aza indole, further refluxing with p-amino ethyl
benzoate gives ethyl4-(1,2-dihydro-2-oxopyrrolo
[2,3]-pyridin-3-ylideneamino) benzoate. Then the
titled compounds i.e Mannich bases of (Z)-ethyl 4-
(1,2-dihydro-2-oxo pyrrolo[2,3-b] pyridin-3-
ylideneamino) benzoate were synthesized by using
dimethyl formamide, formaldehyde and various
aromatic secondary amines \(^{12,13}\) illustrated in Scheme-
I. The chemical structures and purity of synthesized
compounds were confirmed by IR, \(^1\)H NMR, Mass and
the data expressed in Table-2.
<table>
<thead>
<tr>
<th>Code</th>
<th>R</th>
<th>MF</th>
<th>MW</th>
<th>% Yield</th>
<th>M.P(ºC)</th>
<th>*Rf</th>
<th>Elemental analysis (Calcd/Found) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSKa</td>
<td>-N(CH₃)₂</td>
<td>C₁₉H₂₉Na₄O₃</td>
<td>352</td>
<td>80</td>
<td>180-182</td>
<td>0.56</td>
<td>C, 64.76/64.80; H, 5.72/5.6; N, 15.90/15.8; O, 13.62/14.0</td>
</tr>
<tr>
<td>PSKb</td>
<td>N(C₆H₅)₂</td>
<td>C₂₁H₂₂Na₄O₅</td>
<td>380</td>
<td>70</td>
<td>300-301</td>
<td>0.62</td>
<td>C, 66.30/66.80; H, 6.36/6.0; N, 14.73/14.7; O, 12.62/12.4</td>
</tr>
<tr>
<td>PSKc</td>
<td></td>
<td>C₂₂H₂₅N₅O₃</td>
<td>407</td>
<td>68</td>
<td>240-242</td>
<td>0.61</td>
<td>C, 64.85/64.90; H, 6.18/6.2; N, 17.19/17.2; O, 11.78/12.0</td>
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<tr>
<td>PSKd</td>
<td></td>
<td>C₂₁H₂₂Na₄O₅</td>
<td>394</td>
<td>60</td>
<td>295-296</td>
<td>0.51</td>
<td>C, 63.95/63.89; H, 5.62/5.5; N, 14.20/14.20; O, 16.23/16.65</td>
</tr>
<tr>
<td>PSKe</td>
<td>-NH(C₆H₅)CH₃</td>
<td>C₂₄H₂₅Na₄O₅</td>
<td>414</td>
<td>65</td>
<td>160-161</td>
<td>0.51</td>
<td>C, 69.55/69.66; H, 5.35/5.55; N, 13.52/13.61; O, 11.58/11.6</td>
</tr>
<tr>
<td>PSKf</td>
<td></td>
<td>C₂₂H₂₀N₅O₃</td>
<td>392</td>
<td>72</td>
<td>220-222</td>
<td>0.58</td>
<td>C, 69.55/69.8; H, 5.35/5.4; N, 13.52/13.6; O, 11.58/11.6</td>
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<tr>
<td>PSKg</td>
<td></td>
<td>C₂₃H₂₅N₅O₃</td>
<td>389</td>
<td>80</td>
<td>145-146</td>
<td>0.70</td>
<td>C, 64.97/65.0; H, 4.92/4.88; N, 17.98/17.99; O, 12.33/12.36</td>
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<tr>
<td>PSKh</td>
<td></td>
<td>C₂₃H₂₅N₅O₃</td>
<td>435</td>
<td>70</td>
<td>98-100</td>
<td>0.80</td>
<td>C, 63.44/63.55; H, 5.79/5.88; N, 16.08/16.43; O, 14.70/14.82</td>
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<td>PSKi</td>
<td></td>
<td>C₂₂H₂₀N₄O₄</td>
<td>406</td>
<td>68</td>
<td>152-153</td>
<td>0.52</td>
<td>C, 65.01/65.0; H, 5.46/5.40; N, 13.78/13.88; O, 15.75/15.88</td>
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<tr>
<td>PSKj</td>
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<td>C₂₃H₂₇N₅O₃</td>
<td>421</td>
<td>65</td>
<td>224-226</td>
<td>0.48</td>
<td>C, 65.54/65.66; H, 6.46/6.56; N, 16.62/16.50; O, 11.39/11.80</td>
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<tr>
<td>PSKk</td>
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<td>C₂₀H₁₇N₄O₃</td>
<td>375</td>
<td>75</td>
<td>204-205</td>
<td>0.55</td>
<td>C, 63.99/64.0; H, 4.56/4.6; N, 18.66/18.69; O, 12.79/12.81</td>
</tr>
<tr>
<td>PSKl</td>
<td></td>
<td>C₂₃H₂₀N₄O₃</td>
<td>393</td>
<td>80</td>
<td>240-243</td>
<td>0.56</td>
<td>C, 64.11/64.15; H, 5.89/5.91; N, 17.80/17.90; O, 12.20/12.20</td>
</tr>
<tr>
<td>PSKm</td>
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<td>C₂₁H₂₂Na₄O₅</td>
<td>378</td>
<td>65</td>
<td>220-221</td>
<td>0.61</td>
<td>C, 66.65/66.76; H, 5.86/5.87; N, 14.81/14.83; O, 12.68/12.69</td>
</tr>
</tbody>
</table>

*MF= Molecular formulae; MW=Molecular weight, M.P =Melting point.
Table 2: Spectral data of ethyl 4-[(substituted amino) 2-oxopyrrolo [2,3-b]pyridin-3-ylideneamino]benzoate (PSKam)

<table>
<thead>
<tr>
<th>CODE</th>
<th>FT-IR (KBr, cm⁻¹)*</th>
<th>¹H NMR (CDCl₃, δ, ppm)</th>
<th>MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSKa</td>
<td>2936, 1733, 1605, 1271, 1469,3236</td>
<td>δ 8.5 (d, J₇ = 7.4, 1.5 Hz, 1H), 8.41 (d, J₇ = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 - 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.69 (s, 2H), 3.45 (q, J = 8.0 Hz, 2H), 2.34 (s, 6H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>352 (M⁺)</td>
</tr>
<tr>
<td>PSKb</td>
<td>2980, 1729,1608, 1296, 1470,3048</td>
<td>δ 8.88 (d, J₇ = 7.4, 1.5 Hz, 1H), 8.41 (d, J₇ = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.69 (s, 2H), 3.45 (q, J = 8.0 Hz, 2H), 2.34 (s, 6H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>380 (M⁺)</td>
</tr>
<tr>
<td>PSKc</td>
<td>2932, 1744,1610, 1252, 1472,3263</td>
<td>δ 8.2 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.70 (s, 2H), 3.45 (q, J = 8.0 Hz, 2H), 2.50 (s, 8H), 2.32 (s, 3H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>408 (M⁺)</td>
</tr>
<tr>
<td>PSKd</td>
<td>2906, 1728,1598, 1274, 1469,3187</td>
<td>δ 8.3 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.72 (s, 2H), 3.45 (q, J = 8.0 Hz, 2H), 3.67 (t, J = 7.1 Hz, 4H), 2.61 (t, J = 7.1 Hz, 4H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>394 (M⁺)</td>
</tr>
<tr>
<td>PSKe</td>
<td>2924, 1705,1614, 1283, 1447,3033(aromatic CH)</td>
<td>δ 7.9 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 7.27 – 7.20 (m, 2H), 6.88 (tt, J = 7.6, 1.6 Hz, 1H), 6.76 (q, J = 8.1, 1.5 Hz, 3H), 5.95 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 3.04 (s, 3H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>414 (M⁺)</td>
</tr>
<tr>
<td>PSKf</td>
<td>2972,1748,1690, 1229, 1510,3020</td>
<td>δ 8.8 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.69 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 2.60 (t, J = 7.1 Hz, 4H), 1.53 – 1.44 (m, 5H), 1.42 – 1.30 (m, 6H).</td>
<td>392 (M⁺)</td>
</tr>
<tr>
<td>PSKg</td>
<td>2873, 1750, 1679,1267, 1514</td>
<td>δ 8.0 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 6.90 (d, J = 7.5 Hz, 1H), 6.86 (d, J = 7.5 Hz, 1H), 6.21 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 2.37 (s, 3H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>390 (M⁺)</td>
</tr>
<tr>
<td>PSKh</td>
<td>2932, 1744,1610, 1252, 1685,3236</td>
<td>δ 8.9 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.70 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 3.56 (t, J = 7.1 Hz, 4H), 2.81 (t, J = 7.1 Hz, 4H), 2.06 (s, 3H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>435 (M⁺)</td>
</tr>
<tr>
<td>PSKi</td>
<td>2898,1732, 1576,1194, 1629,3065</td>
<td>δ 8.6 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.71 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 2.85 (t, J = 7.1 Hz, 4H), 2.52 (t, J = 7.1 Hz, 4H), 1.38 (t, J = 8.0 Hz, 3H).</td>
<td>406 (M⁺)</td>
</tr>
<tr>
<td>PSKj</td>
<td>2928, 1774,1685, 1255, 1283,3048</td>
<td>δ 8.3 (d, J = 7.4, 1.5 Hz, 1H), 8.41 (d, J = 7.5, 1.5 Hz, 1H), 8.10 (t, J = 7.5 Hz, 1H), 8.07 – 8.01 (m, 2H), 7.39 – 7.34 (m, 2H), 4.70 (s, 2H), 4.35 (q, J = 8.0 Hz, 2H), 2.64 – 2.51 (m, 9H), 2.51 (d, J = 8.0 Hz, 1H), 2.48 (d, J = 8.0 Hz, 1H), 1.38 (t, J = 8.0 Hz, 3H), 1.03 (t, J = 8.0 Hz, 3H).</td>
<td>422 (M⁺)</td>
</tr>
</tbody>
</table>
**Antimicrobial screening**

All the title compounds were screened for their in vitro antimicrobial activity by the Agar diffusion method. To control the sensitivity of the test organisms, the MICs of ampicillin and clotrimazole were determined in parallel experiments. The MIC values were determined as the lowest concentration that totally inhibited visible growth of the microorganisms by adopting serial dilution technique. The MICs of the test compounds PSKα-m and standard drugs is efficiently presented in table 3 and the values are expressed as mean ± standard deviation and statistical analysis was carried out by one-way ANOVA. ***P<0.001, **P<0.01, P<0.05 considered as significant. From the screening, all the compounds showed larger zone of inhibition as compare to standard drug Ampicillin and Clotrimazole. Among all the compounds PSKh, PSKi, PSKm and are more active against the both tested organisms.

*Aliphatic CH, ester C=O, C=N, C-O, aromatic HC=CH stretching respectively.*
Table 3: Antimicrobial activity of ethyl 4-[[substituted amino] 2-oxopyrrolo [2,3-b] pyridin-3-ylideneamino] benzoate (PSKa-m)

<table>
<thead>
<tr>
<th>Compound/Code</th>
<th>Antibacterial Activity</th>
<th>Antifungal Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S. aureus, B. subtilis</td>
<td>E. coli, P. vulgaris</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>24.1 ± 0.2</td>
<td>22.9 ± 0.03</td>
</tr>
<tr>
<td>Clotrimazole</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>PSKα</td>
<td>7.2 ± 0.3</td>
<td>8.3 ± 0.2</td>
</tr>
<tr>
<td>PSKb</td>
<td>4.6 ± 0.2</td>
<td>5.6 ± 0.2</td>
</tr>
<tr>
<td>PSKc</td>
<td>10.5 ± 0.5</td>
<td>12.6 ± 0.4</td>
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<tr>
<td>PSKd</td>
<td>17.1 ± 0.4</td>
<td>18.6 ± 0.6</td>
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<tr>
<td>PSKe</td>
<td>18.4 ± 0.2</td>
<td>19.1 ± 0.3</td>
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<tr>
<td>PSKf</td>
<td>7.2 ± 0.7</td>
<td>7.9 ± 0.05</td>
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<tr>
<td>PSKg</td>
<td>12.3 ± 0.5</td>
<td>14.4 ± 0.5</td>
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<tr>
<td>PSKh</td>
<td>23.7 ± 0.5***</td>
<td>22.6 ± 0.5***</td>
</tr>
<tr>
<td>PSKι</td>
<td>22 ± 1.7***</td>
<td>22.2 ± 0.4***</td>
</tr>
<tr>
<td>PSKj</td>
<td>19.8 ± 0.2</td>
<td>19.8 ± 0.2</td>
</tr>
<tr>
<td>PSKκ</td>
<td>15.1 ± 0.3</td>
<td>16.5 ± 0.1</td>
</tr>
<tr>
<td>PSKι</td>
<td>21.3 ± 0.4</td>
<td>20 ± 0.5</td>
</tr>
<tr>
<td>PSKm</td>
<td>22.9 ± 0.1***</td>
<td>21.8 ± 0.1***</td>
</tr>
</tbody>
</table>

*Values are expressed as Mean ± SD (n=3). ***P <0.001, **P <0.01, *P <0.05.
All significant differences are considered from control value 0.00; NA=not applicable.

CONCLUSION

With an aim of developing potent antimicrobial agent, a series of novel Mannich bases of 7-Azaisatin derivatives were synthesized from azaindole, molecular structures, purity of compounds confirmed and screened for their in vitro antimicrobial activity. The results concluded that compounds containing N acetyl piperazine, pyrolidine, piperidinone superior activity against gram +ve, gram-ve bacteria, on fungi strains in other hand compounds containing N ethyl piperazine, pyrolidine shown good results against fungi. It has been very clear from the above findings this progression of novel Mannich bases of 7-Azaisatin derivatives were biologically active, potent and a significant importance in medicinal chemistry.

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